ABSTRACT

Document Title: Performance assessment of nonlinear control loops having multifractal data

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Control loop performance assessment is necessary to determine the operating condition of a control loop. Most of the control loop performance assessment methodologies are not able to do the assessment of nonlinear control loops. A new methodology has been developed for the performance assessment of a Nonlinear SISO feedback control loop. The methodology is based on the generalized Hurst exponent and is applicable when the data is multifractal (with two scales) in nature. It doesn't need any control loop data as an a priori to function. The method gives a more robust performance index of control loops with nonlinearities when compared to the commonly used Minimum variance index. It has been tested on control loops with saturation, backlash, deadzone and a physical system approximated by a neural network.

Keywords: Detrended Fluctuation analysis, Hurst exponent, Control loop performance assessment